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NAVAL UNDERWATER SYSTEMS CENTER
NEWPORT R I

NORLANT 72 PHASE 2 OPERATION PLAN. (U)
JUN 72

GDS NUSC-TD-4367

ABSTRACT

This document describes the operational aspects of the signal and noise directionality, ambient noise, bottom characteristics, and oceanographic experiments that comprise Phase 2 of NORLANT 72. The command and control organization, event details, schedules of events, and plans for ships, aircraft, communications, and environmental data are delineated for the studies to be conducted July-August 1972 in the Labrador Basin.

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LIST OF ABBREVIATIONS

AXBT	Aircraft expendable bathythermograph
CDA	Cross-dipole array
CFAV	Canadian Forces Auxiliary Vessel
COMEX	Commencement of exercise/event
CONGRATS	Continuous-gradient ray-tracing system
CTD/SV	Conductivity-temperature-depth/sound-velocity (probe)
CW	Continuous wave
DREA	Defense Research Establishment Atlantic (Canadian)
FINEX	End of exercise/event
FNMC	Fleet Numerical Weather Central
GMT	Greenwich mean time
IOMEDEX	Ionian Mediterranean Exercise
LDGO	Lamont-Doherty Geophysical Observatory
LRAPP	Long-Range Acoustic Propagation Project
MABS	Moored acoustic buoy system
NAVOCEANO	Navy Oceanographic Office
NFEC	Naval Facilities Engineering Command
NRL	Naval Research Laboratory
NUSC	Naval Underwater Systems Center
NUSC/NL	New London Laboratory, Naval Underwater Systems Center
ONR	Office of Naval Research
PDR	Precision depth recorder
RF	Radio frequency
R/V	Research vessel
S/N	Signal-to-noise ratio
SOA	Speed of advance
SSOB	Senior scientist on board

LIST OF ABBREVIATIONS (Cont'd)

STD	Salinity, temperature, depth (profile)
SUS	Signal, underwater sound
SVP	Sound-velocity profile
TABS	Telemetering acoustic buoy system
USB	Upper sideband
USNS	U.S. Naval Ship
USOP	Undersea Surveillance Oceanographic Project
VLA	Vertical line array
VLAM	Vertical-line-array measuring (system)
XBT	Expendable bathythermograph
Z	Time zone Z (Greenwich mean time)

NORLANT 72 PHASE 2 OPERATION PLAN

I. INTRODUCTION

A. OBJECTIVE

(C) The objective of the Phase 2 Operation Plan is to provide acoustic and environmental data for evaluation of the Labrador Basin with respect to surveillance requirements. This will involve the following efforts:

- Measure propagation loss, noise, and signal-to-noise ratio (S/N) versus depth (100 to 12,000 ft), frequency (10 to 2500 Hz), and geographic location.
- Measure vertical directionality of signal (source range 20 to 300 nmi) and ambient noise.
- Measure bottom acoustic and geological characteristics in support of acoustic propagation and engineering requirements.
- Measure environmental parameters of the ocean volume as a function of depth to support environmental modeling of the area.

B. ORGANIZATIONS

(U) The organizations involved are

Commands

Office of Naval Research, ONR 102-OS

Manager, ASW Systems Projects, ASW-21

Naval Facilities Engineering Command. FPO-1

U. S. Navy Laboratories

Naval Underwater Systems Center, New London Laboratory, NUSC/NL

Naval Air Development Center, NADC

Civilian Institutions

Lamont-Doherty Geophysical Observatory, LDGO

C. COMMAND AND CONTROL

(U) Responsibility for the scientific planning and direction of NORLANT Phase 2 is distributed as follows.

Principal Personnel

Chief Scientist	R. Martin, NUSC/NL
Operations, Logistics, and Oceanographic Data Coordinator . . .	K. W. Lackie, NAVOCEANO
Assistant Oceanographic Data Coordinator	J. Syck, NUSC/NL

Principal Investigators

R. L. Martin, NUSC SSOB SANDS, 29 July to 8 August, acoustic data

S. R. Santaniello, NUSC SSOB SANDS, 9 to 20 August, bottom reflectivity

J. Gallagher, NUSC oceanographic data

P. Van Schuyler, NADC SSOB R/V PIERCE, VLAM acoustic data

L. Allen, NADC SSOB R/V LANGEVIN, NADC AUTOBUOY data

J. Ewing, LDGO seismic data

(U) Under the general guidance of ONR Code 102-OS, the chief scientist is responsible for overall experiment planning, issuing task assignments to principal investigators, coordinating field experiments, and coordinating the reporting of experimental results.

(U) The Operations, Logistics, and Oceanographic Data Coordinator is responsible for the administration and logistics arrangements necessary to coordinate the various operations of the NORLANT exercise. He assists the chief scientist in preparing and executing the technical plan and in matters relating to logistics, communications, security, and shore support. He also assists the chief scientist in the planning and coordination of environmental measurements and is responsible for summarizing and reporting oceanographic data pertinent to the NORLANT Phase 2 experiment.

(U) The principal investigators are responsible for ensuring that their assigned tasks are carried out. The senior scientists on board (SSOB) each ship or aircraft are additionally responsible for preparing a preliminary operation report discussing the success of the operation, problems encountered, quality of the data, recommendations for future operations, and pertinent operations and data logs. Operation reports are to be forwarded to the Chief Scientist, who will issue an integrated preliminary report to ONR and ASW-21 and information copies to participants.

(U) Ship and aircraft operational control and logistics support will be provided by the following activities.

USNS SANDS — SANDS sails under MSC sailing orders and obtains logistics support and port clearances through the MSC representative at St. John's, Newfoundland.

R/V GEORGE W. PIERCE and R/V PAUL LANGEVIN — Both ships are under contract from Marine Acoustical Services (MAS) to MSC for use by NAVAIRSYSCOM. Both ships sail under MSC sailing orders, but MAS arranges port clearances and logistics support through the MAS agent in St. John's, Newfoundland.

NC121 Aircraft — The aircraft is under operational control of the Naval Air Facility, Warminster, Pennsylvania. The flight captain is to make arrangements for land support and logistics.

D. GENERAL AREA INFORMATION

(U) Daylight Periods at 56° North Latitude (All Times Local)

Date	Daylight	Sunrise	Sunset
18 July	Always Light	0339	2032
12 Aug	0100-2302	0425	1944
6 Sep	0251-2101	0514	1841

(C) Significant Water Depths

Site M-1	12,000 ft
Site M-2	13,800 ft
Site C	12,600 ft

(C) Significant Distances

St. John's to Site V	400 nmi
St. John's to Station 1	580 nmi
St. John's to M-1	440 nmi
St. John's to M-2	360 nmi
Site V to Station 1	200 nmi
Site V to Station 2	300 nmi

E. MAJOR EQUIPMENT

(U) Ships

USNS SANDS

R/V GEORGE W. PIERCE

R/V PAUL LANGEVIN II

(U) Aircraft

NADC Aircraft (NC121)

(U) Measurement Systems

MABS (Moored Acoustic Measurement System, NUSC)

VLAM (Vertical Line Array Measuring System, NADC)

AUTOBUOYS (1 NUSC and 2 NADC)

TABS (Telemetering Acoustic Buoy, NUSC)

Environmental arrays (NUSC and NAVOCEANO)

"Pile-On" corer (NUSC)

CTD/SV (Conductivity, Temperature, Depth, and Sound Velocity) Probe

SONOBUOYS

BTs

F. COGNIZANT PERSONNEL

(U) Personnel cognizant of various aspects of the NORLANT Phase II experiment can be reached at NUSC or NADC, as appropriate, by telephone.

NUSC	Commercial, Area Code 203 442-0771; AUTOVON 636 plus extension.
NADC	Commercial, Area Code 214 672-9000; AUTOVON 441 plus extension.

(U) NUSC Personnel

R. Martin — overall operations (at sea 12 July-12 August), x2832

R. W. Hasse — overall operations, x2420

R. LaPlante — overall operations, x2429

P. King — electronic equipment, x2673

G. Griffin — mechanical equipment, x2806

(U) NADC Personnel

E. Garabed — overall operations, x2130

J. Keane — overall operations, x2130

J. Howard — overall operations, x2635

K. Jerome — overall operations, x2145

II. TECHNICAL PLAN

A. GENERAL

(C) Phase 2 of NORLANT 72 will be carried out in the Labrador Basin from 29 July to 19 August 1972. Significant sites and tracks are shown in figure 1 and listed in table 1. Sites M-1 and M-2 indicate where MABS will be deployed for Phases 1 and 2, respectively. The environmental arrays will continue to record data at site M-1 beyond Phase 2. Site V represents the deployment site for VLAM. The NAVOCEANO environmental array will continue to record at site M-2, where it was emplanted for Phase 1.

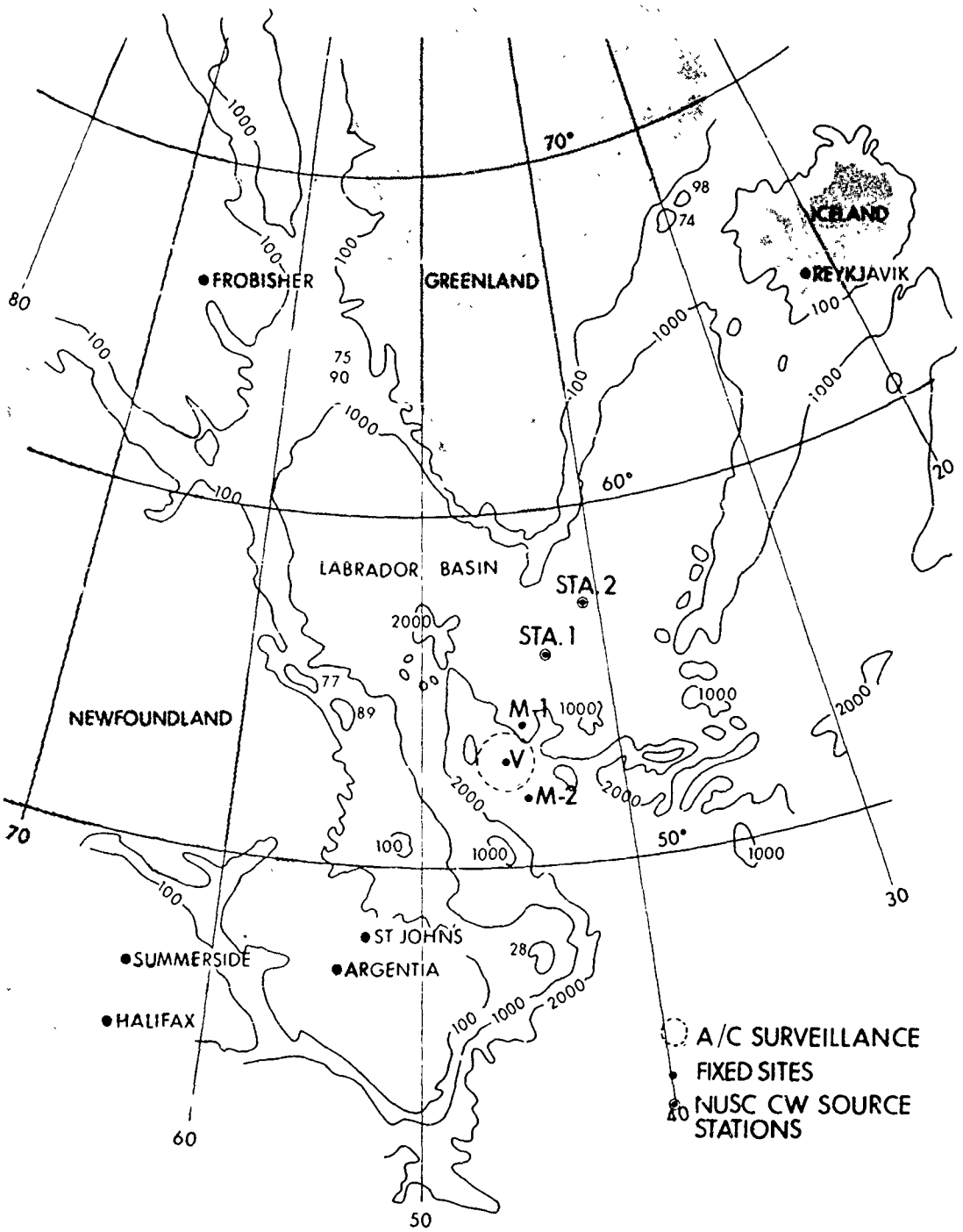


Figure 1. (C) NORLANT 72 Phase 2 Positions (U)

Table 1. (C) Site and Station Positions (U)

Site or Station	Coordinates	Remarks
M-2	52°N, 45°W	MABS and NAVOCEANO Environmental Array
M-1	54°N, 45°W	NUSC and NAVOCEANO Environmental Arrays To Be Retrieved
V	53°N, 46°W	VLAM
1	55°50'N, 42°30'W	NUSC CW Source
2	57°10'N, 41°10'W	NUSC CW Source

(C) During VLAM deployment, LANGEVIN and PIERCE will activate NADC CW sound sources within 50 nmi of VLAM at depths of 100 and 500 ft, and the NUSC two-frequency source will be deployed at stations 1 and 2. AUTOBUOY and SONOBUOYS will be deployed from SANDS at site M-2 and station 1 to obtain data at depths not possible with MABS. Bottom loss measurements will be obtained by NADC, using aircraft and SONOBUOYS at site V. NUSC and LDGO will measure bottom characteristics, using AUTOBUOY, TABS, and SONOBUOY as receivers, with AIR GUN and shots as sources deployed from SANDS at a location 15 nmi southeast of site M-1 and 15 nmi east of site M-2. NADC aircraft will conduct shipping surveillance within a 100-nmi radius of site V and will drop SONOBUOYS and AXBT's. Bottom sediment cores to a sediment depth of 20 ft will be obtained at the acoustic measurement sites for bottom characteristics. Ten "boomerang" cores will be obtained on a track between sites M-1 and M-2.

B. EVENT DESCRIPTIONS

MABS and Environmental Arrays

(C) MABS will be rigged for Phase 1 deployment prior to leaving St. John's Newfoundland: rigging for Phase 2 deployment will take place at sea. Once the site survey is complete, procedures used in IOMEDEX will be used to deploy the MABS. The environmental arrays deployed in Phase 1 will remain in place to record data during Phase 2. Acoustic transponder releases attached near the anchor will be interrogated to determine the final position. The time required for deployment of the array is about two hours, with an additional six hours required to determine the final position. Hydrophone depths will be 250, 450, 1000, 1500, and 2000 ft. Hydrophone outputs will be sampled sequentially for 30 sec each every hour during the emplantment period. Shot data will not be collected for processing. Environmental sampling will occur every 5 min and will include current speed and direction and sea water conductivity, temperature, and pressure at depths of 400, 1300, and 5600 ft. Current measurements will also be obtained at 3000, 9500, and 12,000 ft.

AUTOBUOYS, SONOBUOYS, and CTD/SV Probe

(C) The NUSC AUTOBUOY will be deployed from SANDS to obtain the ambient noise level (8 to 2500 Hz) at each of five depths, starting at 1000 ft off the bottom and hovering, in sequence, at depths of 9500, 5600, 4000, and 2000 ft. The NUSC AUTOBUOY will collect a 20-min broadband sample of ambient noise at each depth. SANDS will transit radially to a distance of 2 nmi and deploy two

SONOBUOYS, one with hydrophone at 300 ft and the other with hydrophone at 100 ft. SANDS will then continue on the same course for an additional 3 nmi and assume the "quiet ship" condition. While at "quiet ship," a CTD/SV profile to 1000 ft from the bottom will be obtained by SANDS. These deployments will occur at sites M-1 and M-2.

(C) The two NADC AUTOBUOYS will be deployed from LANGEVIN to sample ambient noise and signals in the band 8 to 2500 Hz at five depths each, with one of the depths common to both units. After the AUTOBUOYS are deployed, LANGEVIN and PIERCE will take positions at prescribed ranges from the deployment position and will activate CW sources in accordance with Annex A. These deployment will take place during a 16- to 20-hour period every two days for eight days.

VLAM

(C) PIERCE will deploy VLAM at a position such that the expected average position of its 8-day drift pattern will be at site V (figure 1). The center point of the 360-ft, 26-hydrophone array will be at a depth of 1000 ft. Ambient noise and signals generated by sources deployed from LANGEVIN, PIERCE, and SANDS will be telemetered to PIERCE for recording and processing during a 27-hour period every two days, in accordance with Annex B.

CW Sound Sources

(C) LANGEVIN will deploy two CW sources at nine different stations located between the first and second convergence zones relative to VLAM. PIERCE will deploy two CW sources at nine different stations located up to the first convergence zone. During the first and third deployments, the sources will operate at a depth of 100 ft over a 27-hour VLAM data acquisition period. During the second and fourth deployments, the sources will operate at 500 ft over a similar acquisition period. The PIERCE sources will transmit at frequencies of 96 and 384 Hz; the LANGEVIN sources will transmit at 77 and 346 Hz; all sources will have a source level of 90 dB//1 μbar. Each source will transmit for 45 min at each station in a sequence described in Annex B.

(C) During the NADC AUTOBUOY deployments, sources will be deployed from LANGEVIN and PIERCE and operated in a pulsed mode, as described in Annex A.

(C) A third source, operating simultaneously at 85.47 and 128.205 Hz and at a 90-dB source level, will be deployed from SANDS at the same depths and will be sequenced in the same manner as the sources deployed from LANGEVIN. The SANDS' sources will be deployed at long range (stations 1 and 2), and the time at each station will be divided equally between 100- and 500-ft operation.

Surface Ship Surveillance and Aircraft-Deployed SONOBUOYS

(C) During the VLAM deployment period, the NADC aircraft will conduct shipping surveillance, three days out of every five, over an area with a radius of at least 100 nmi from the present VLAM positions. The surveillance schedule is given in Annex C. Ship positions and velocity will be determined, and ships will be identified as to type when possible. During this period, 10 calibrated acoustic SONOBUOYS (SSQ-57A) and eight AXBT's will be deployed and the results recorded aboard the aircraft.

Bottom Acoustic Characteristics

(C) Bottom acoustic characteristics will be determined at a location 15 nmi southeast of site M-1 and 15 nmi east of site M-2, over the frequency range 20 to 1000 Hz, and as a function of grazing angle from 5 to 90°. SANDS will deploy acoustic receiving systems at each site and transit radially while exciting a sound source and launching explosives. Each transit will be composed of three legs (see figure 2).

(C) At each site, SANDS will first deploy the following items prior to radial transit away from the site:

a. TABS — one hydrophone at 800 ft and the other at 3000 ft.

b. NUSC AUTOBUOY — set for 6000-ft operation and a three-hour start delay.

c. SONOBUOY (AN/SSQ-57A) — at 300 ft.

(C) SANDS will deploy an AIR GUN and a small towed array and will transit along a radial track for approximately 15 kyd, firing the AIR GUN at a 10-sec repetition rate.

(C) At a distance of 15 to 30 kyd, SANDS will launch Mk 94 charges every three min at an SOA of three knots. The charges will be set to detonate at a depth of 3000 ft. The three-hour start delay will synchronize AUTOBUOY's recording with the other operations.

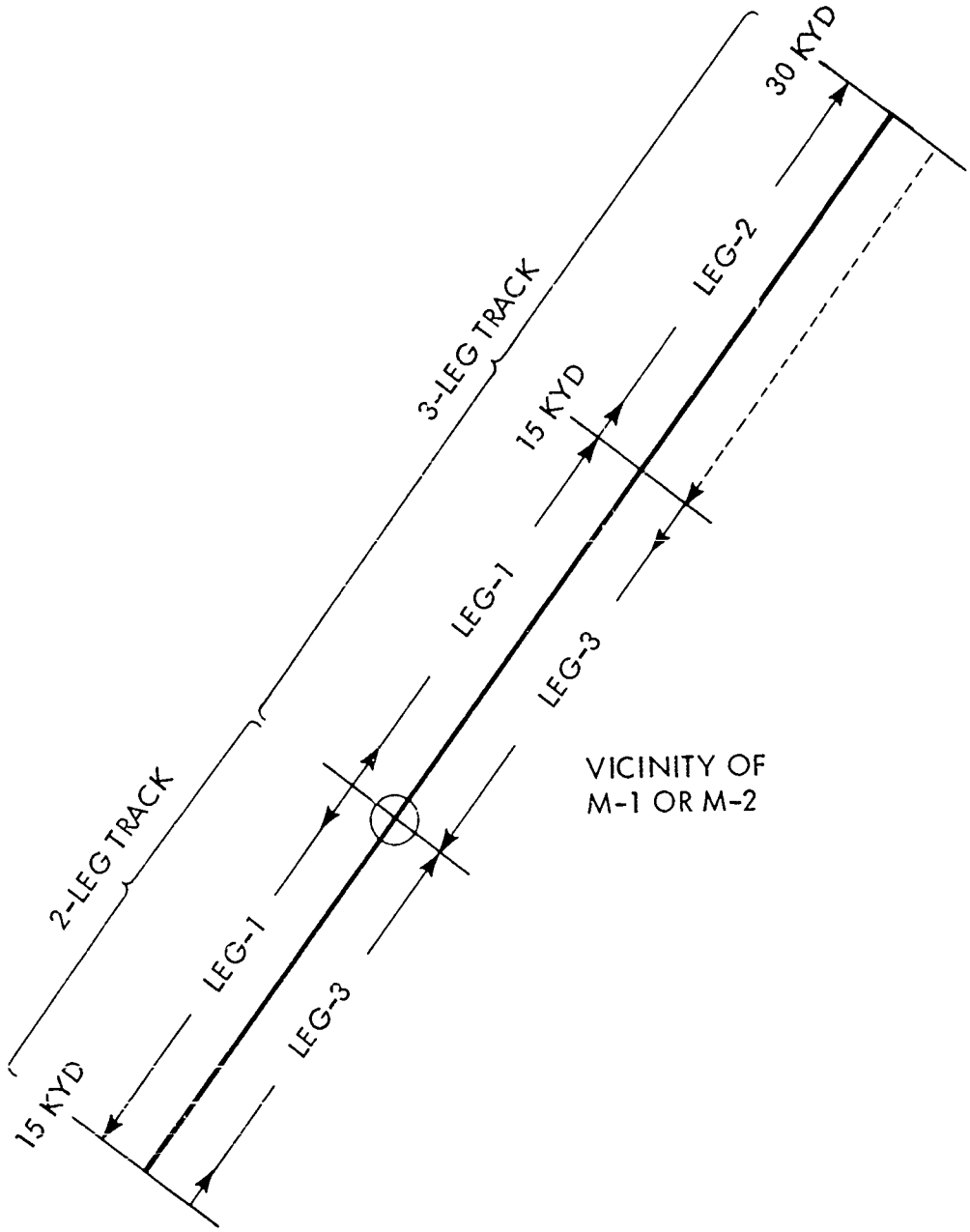


Figure 2. (C) NORLANT 72 Phase 2 Bottom Acoustic Characteristics Operations Tracks (U)

Site Survey

(U) Before emplanting MABS, a site survey that includes bathymetry with accurate navigation control will be required. Satellite navigation with OMEGA and LORAN A will be used for this purpose. Surface current measurements will also be obtained. This event, including evaluation of the data, will take 12 hours.

Geological Survey

(U) Bottom sediment cores (20 ft) will be obtained at the acoustic measurements sites for bottom characteristics on those days that bottom acoustic characteristics are not being measured. Boomerang cores will be deployed at 10 locations during SANDS' transit between sites M-1 and M-2.

Bathymetry

(U) Bathymetry will be taken during site surveys and during all transits by SANDS between stations.

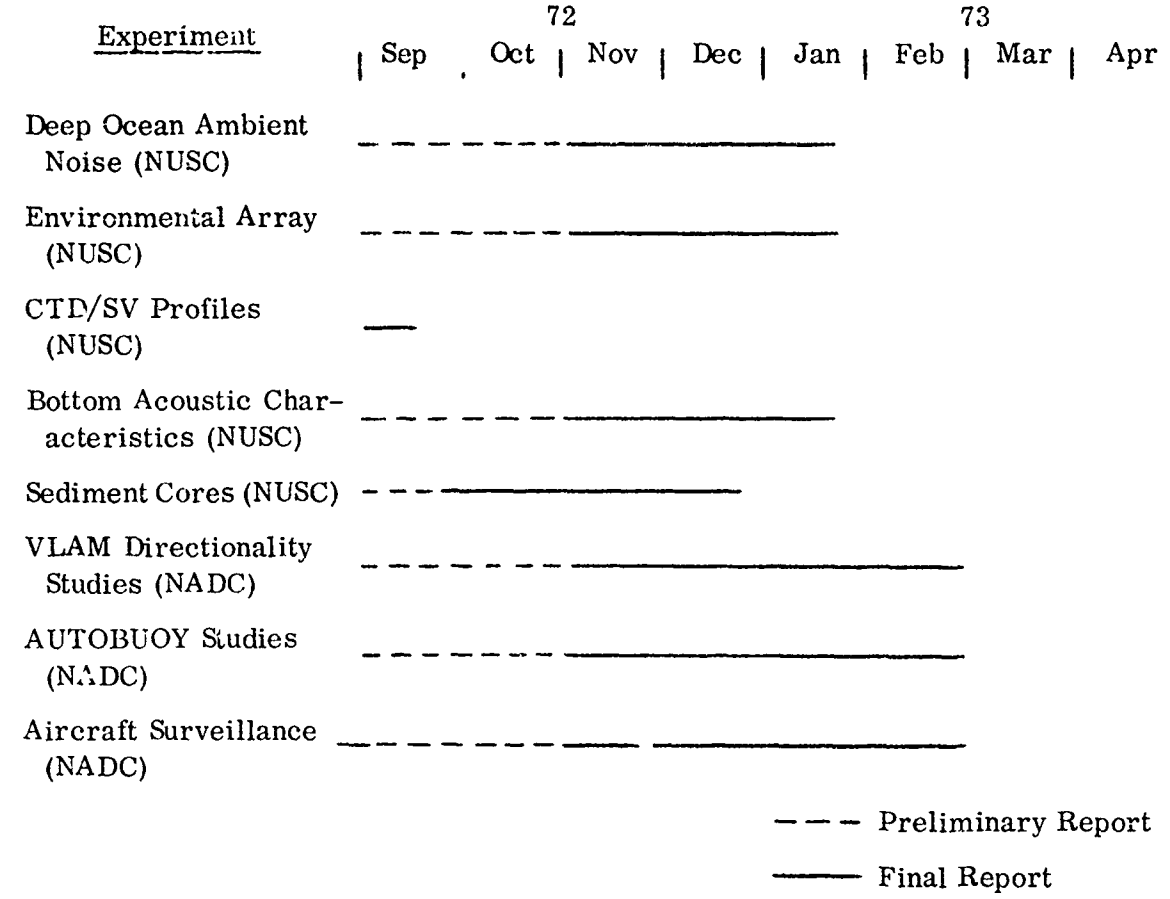
Expendable Bathythermograms (XBT's)

a. Ships — Each ship will take one 2500-ft XBT every six hours while at sea.

b. Aircraft — The NADC aircraft will take eight AXBT's every day it is on station.

C. REPORTING SCHEDULE

(U) The reporting schedule is as shown below.



III. SCHEDULE OF EVENTS

(U) The event schedules for SANDS, PIERCE, LANGEVIN, and the NADC aircraft are shown in tables 2 through 5. Operational information for the sensors and sources is listed in table 6. Figure 3 shows the deployment periods for the systems and sound sources employed during Phase 2; ship position schedules are shown at the bottom of figure 3.

Table 2. (C) USNS SANDS Operating Schedule (U)

Event	Date	Time(Z)	Operation
S01	29 July	0000	Detached from Phase 1 operation. Refurbish MABS for redeployment at site M-2.
S02		1200	Transit to site M-2. Conduct bathymetric survey en route.
S03	30 July	0600	Arrive site M-2. Commence site survey.
S04		1800	End site survey. Deploy MABS at M-2.
S05		2300	End MABS deployment. Deploy AUTOBUOY, SONOBUOY, and CTD/SV.
S06	31 July	1100	Retrieve equipment. Commence water test of TABS.
S07	1 Aug	1100	Complete TABS test. Transit to station 2.
S08	2 Aug	2315	Arrive station 2. Deploy HX 231F source. Commence signal and noise directionality study using VLAM.
S09	4 Aug	0230	End directionality study. Transit to station 1.
S10		1500	Arrive station 1. Deploy AUTOBUOY, SONOBUOY, and CTD/SV.
S11		2315	Retrieve equipment. Commence signal and noise directionality studies using VLAM.
S12	5 Aug	1300	End signal and noise directionality studies. Transit to St. John's.

Table 2 (Cont'd). (C) USNS SANDS Operating Schedule (U)

Event	Date	Time(Z)	Operation
S13	7 Aug	2300	Arrive St. John's.
S14	9 Aug	1100	Depart St. John's for site M-1.
S15	11 Aug	1100	Arrive M-1. Commence bottom characteristics studies.
S16	12 Aug	0900	End bottom characteristics studies. Commence deep cores.
S17	13 Aug	0900	End coring. Commence bottom characteristics study at site M-1.
S18		2100	End bottom characteristics study. Commence transit to site M-2. Take Boomerang cores en route.
S19	15 Aug	1100	Arrive M-2. Commence bottom characteristics study.
S20	16 Aug	0900	End bottom characteristics study. Commence 20-ft cores.
S21	17 Aug	0900	End coring. Commence bottom characteristics study.
S22		2100	End bottom characteristics study. Transit to St. John's.
S23	19 Aug	1100	Arrive St. John's. Prepare for Phase 3.

Table 3. (C) R/V G. W. PIERCE Operating Schedule (U)

Event	Date	Time(Z)	Operation
P01	31 July	0900-1900	Deploy VLAM system.
P02		1900-2000	Position ship downwind of VLAM buoy and lower projector to 100-ft depth.
P03		2000-2100	Perform "GO" condition checks of in-water system.
P04	31 July 1 Aug	2100-2400 2400-0300	Perform array calibration and beam pattern measurement, maintaining reasonably constant buoy-to-ship distance.
P05		0300-0400	Position ship 2 nmi downwind of VLAM buoy and lower projector to 100-ft depth.
P06		0400	COMEX VLAM test period No. 1 (see test period plan, Annex B).
P07	2 Aug	0700	FINEX VLAM test period No. 1.
P08		0700-1100	Position ship 10 nmi downwind of VLAM buoy and lower projector to preassigned depth for AUTOBUOY. Await arrival of LANGEVIN at point OSCAR.
P09		1100-2015	AUTOBUOY test period No. 2.
P10		2015-2115	Position ship 2 nmi downwind of VLAM buoy and lower projector to 500-ft depth.
P11		2115-2315	Await arrival of LANGEVIN at its VLAM COMEX position and maintain 2-nmi range to VLAM buoy.
P12		2315	COMEX VLAM test period No. 2
P13	4 Aug	0230	FINEX VLAM test period No. 2.
P14	4 Aug	0230-0900	Position ship 10 nmi downwind of VLAM buoy and lower projector to preassigned depth for AUTOBUOY. Await daylight and arrival of LANGEVIN at its AUTOBUOY COMEX position.

Table 3 (Cont'd). (C) R/V G. W. PIERCE Operating Schedule (U)

Event	Date	Time(Z)	Operation
P15	4 Aug	0900-1915	AUTOBUOY test period No. 3.
P16		1915-2015	Position ship 2 nmi downwind of VLAM buoy and lower projector to 100-ft depth.
P17		2015-2315	Await arrival of LANGEVIN at VLAM COMEX position and maintain 2-nmi range to VLAM buoy.
P18		2315	COMEX VLAM test period No. 3.
P19	6 Aug	0215	FINEX VLAM test period No. 3.
P20	7 Aug	0215-0900	Position ship 10 nmi downwind of VLAM buoy and lower projector to preassigned depth for AUTOBUOY. Await daylight and arrival of LANGEVIN at point OSCAR.
P21		0900-1915	AUTOBUOY test period No. 4.
P22		1915-2015	Position ship 2 nmi downwind of VLAM buoy and lower projector to 500-ft depth.
P23		2015-2315	Await arrival of LANGEVIN at VLAM COMEX position and maintain 2-nmi range to VLAM buoy.
P24		2315	COMEX VLAM test period No. 4.
P25	8 Aug	0215	FINEX VLAM test period No. 4.
P26		0215-0815	Transit to VLAM buoy.
P27		0815-0900	Await daybreak.
P28		0900-2100	Retrieve VLAM system.
P29	9-10 Aug		Transit to St. John's.
P30	11-25 Aug		Contingency time.

Table 4. (C) R/V PAUL LANGEVIN II Operating Schedule (U)

Event	Date	Time	Operation
L01	31 July	0900-0945	Deploy AUTOBUOY No. 1 and COMEX AUTOBUOY test No. 1.
L02		0945-1030	Transit to PS2 (see figure 1 of Annex A).
L03		1030-1730	Continue AUTOBUOY test No. 1.
L04		1730-1815	Transit to point OSCAR and FINEX AUTOBUOY test No. 1.
L05		1815-2015	Retrieve AUTOBUOY.
L06	1 Aug	2015-2400 0000-0300	Position ship 20 nmi downwind of VLAM buoy and await COMEX.
L07		0300-0400	Await COMEX for VLAM and lower projector to 100-ft depth.
L08		0400	COMEX VLAM test No. 1 (see test period plan, Annex B).
L09	3 Aug	0700	FINEX VLAM test No. 1.
L10		0700-1100	Transit to point OSCAR for event ALPHA.
L11		1100-1145	Deploy AUTOBUOY and COMEX AUTOBUOY test No. 2.
L12		1145-1230	Transit to point PS2.
L13		1230-1930	Continue AUTOBUOY test No. 2
L14		1930-2015	Transit to point OSCAR and FINEX AUTOBUOY test No. 2.
L15		2015-2215	Retrieve AUTOBUOY.
L16		2215-2330	Position ship 20 nmi downwind of VLAM buoy and lower projector to 500-ft depth.
L17		2330	COMEX VLAM test No. 2 (see test period plan, Annex B).
L18	4 Aug	0230	FINEX VLAM test No. 2.
L19		0230-0600	Transit to point OSCAR for event BRAVO.
L20		0600-0900	Await daybreak.

Table 4 (Cont'd). (C) R/V PAUL LANGEVIN II Operating Schedule (U)

Event	Date	Time	Operation
L21	4 Aug	0900-0945	Deploy AUTOBUOY and COMEX AUTOBUOY test No. 3.
L22		0945-1100	Transit to point S2.
L23		1100-1900	Continue AUTOBUOY test No. 3.
L24		1800-1915	Transit to point OSCAR and FINEX AUTOBUOY test No. 3.
L25		1915-2115	Retrieve AUTOBUOY.
L26		2115-2315	Position ship 20 nmi downwind of VLAM buoy and lower projector to 100-ft depth.
L27		2315	COMEX VLAM test No. 3 (see test period plan, Annex B).
L28	6 Aug	0215	FINEX VLAM test No. 3.
L29		0215-0900	Transit to point OSCAR for event BRAVO. Await daybreak.
L30		0900-0945	Deploy AUTOBUOY and COMEX AUTOBUOY test No. 4.
L31		0945-1100	Transit to point PS2.
L32		1100-1900	Continue AUTOBUOY test No. 4.
L33		1900-1915	Transit to point OSCAR and FINEX AUTOBUOY test No. 4
L34		1915-2115	Retrieve AUTOBUOY.
L35		2115-2315	Position ship 20 nmi downwind of VLAM buoy and lower projector to 500-ft depth.
L36	7 Aug	2315-2400 2400-0300	COMEX VLAM test period No. 4 (see test period plan, Annex B).
L37	8 Aug	0600-2400 0000-0215	FINEX VLAM test No. 4.
L38	8-9 Aug		Transit to St. John's.
L39	10-28 Aug		Contingency time.

Table 5. (C) NADC Aircraft Operating Schedule (U)

Event	Date	Takeoff Time(Z)	Scheduled Operation
A01	29 July	1100	Transit NAF Warminster to Goose Bay, Labrador.
A02	30 July	None	Check and calibrate.
A03	31 July	1100	Project flight — plan B (Annex C).
A04	1 Aug	1100	Project flight — plan A (Annex C).
A05	2 Aug	1100	Project flight — plan B (Annex C).
A06	3 Aug	None	Aircraft maintenance and contingency.
A07	4 Aug	None	Aircraft maintenance and contingency.
A08	5 Aug	1100	Project flight — plan A.
A09	6 Aug	1100	Project flight — plan B.
A10	7 Aug	1100	Project flight — plan A.
A11	8 Aug	None	Aircraft maintenance and contingency.
A12	9 Aug	None	Aircraft maintenance and contingency.
A13	10 Aug	1100	Conduct bottom loss event with SONOBUOY at site V.

Table 6. (C) Sensor and Source Information (U)

Sensor or Source	Site or Station	Unit Depths (ft)	Remarks
MABS 1	M-2	250, 450, 1000, 1500, 2000	Sampling period 1 hr, 31 Jul-30 Aug
Environmental arrays	M-1, M-2	400, 2000, 4000, 5600, 9500, 12,000	Sampling periods 5 and 15 min, 19 Jul-6 Sept
SONOBUOYS	V, M-2, Sta. 1 V, M-1, M-2	100, 300 300	Ambient noise Bottom loss
CTD/SV probe	M-2, Sta. 1	Continuous to 10,000 ft	Environmental data
NUSC AUTOBUOY	M-1, Sta. 1 M-1, M-2	2000, 4000, 5600, 9500, 12,000 ft 6000 ft	Ambient noise Bottom loss
TABS	M-1, M-2	800 & 3000 ft	Bottom loss
NADC AUTOBUOY	V	1000 ft to bottom	Ambient noise
CW sources	V, Sta. 1, Sta. 2	100 & 500 ft	Directionality
VLAM	V	Center of 360-ft array at 1000 ft	Directionality
SUS charges	M-1, M-2	3000 ft	Bottom loss
AXBTs & XBTs	Along ship and aircraft tracks	XBTs 2500 ft, AXBTs 1000 ft	Environmental data

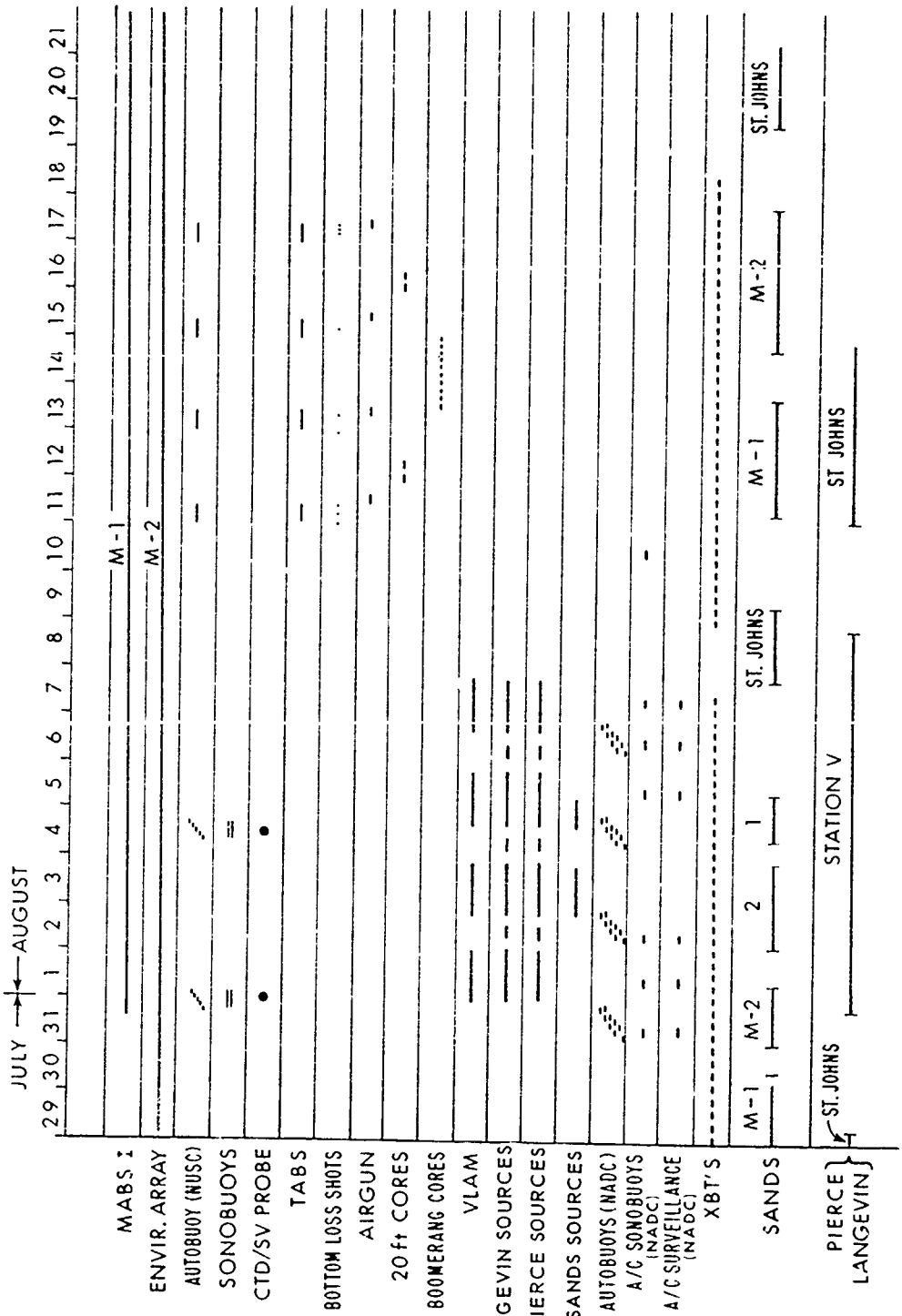


Figure 3. (C) NORLANT 72 Phase 2 Source/Sensor Deployment (U)

IV. COMMUNICATIONS PLAN

(U) Communications will be kept to the minimum required to conduct the operations plan. Ship call signs, event numbers, and code words will be used to provide brevity and security to all traffic.

Frequency Assignments

(C) Channel	Assignment	Designation	Frequency	Emission
1	Ship & A/C to Ship	Primary HF	2336 kHz	AM
2	Ship & A/C to Ship	Secondary HF	2716 kHz	AM
3	A/C to Ship	Primary UHF	336.2 MHz	
4	A/C to Ship	Secondary UHF	338.0 MHz	
5	A/C to Ship	Alternate Secondary UHF	333.4 MHz	
6	Ship to Ship	Primary VHF	32.5 MHz	
7	Ship to Ship	Secondary VHF	149.13 MHz	
8	Ship to Ship	Alternate Secondary HF	8281 kHz	SSB (USB)
9	Ship to Shore	MAS Vessels	12424.5 kHz	(USB)
10	Ship to Shore	SANDS	13680 kHz	SSB (USB)
11	VLAM Data		138-150 MHz	
12	VLAM Commands		213-230 MHz	
13	AUTOBUOY Recovery		4.625 MHz	

Call Signs

(C)	
USNS SANDS	ALTO SAX
R/V G. W. PIERCE	Whiskey Yankee 5240
R/V PAUL LANGEVIN II	Whiskey Echo Echo ALFA
Aircraft NC-121	Bird 388
P-3A (Alternate)	Bird 883

Code Words

(C) Coded radio communications will be utilized as follows.

Words and Word Sets Disallowed for Communications	Allowed Code
VLAM Equipment	Victor
Radio	Omaha
Projector	Peter
Frequency No. 1 (96 Hz)	Fred 1
Frequency No. 2 (384 Hz)	Fred 2
Frequency No. 3 (85 Hz)	Fred 3
Frequency No. 4 (128 Hz)	Fred 4
AUTOBUOY	Apple
Aircraft (Navy 388 or 883)	Bird
Depth (1000 ft)	Delta
Array	Stick
Sonar	Scenery
Batteries	Echo
Radar	Romeo
Source Level (90 dB)	Lima
SONOBUOY (Channel x)	Banana (x)
Hydrophone	Hotel
MABS	Monkey
Environmental Array	Edith
Seismic Array	Sam
AIR GUN	Park
TABS	Total

Words and Word Sets Disallowed for Communications	Allowed Code
Mk 3000	Rap
2-Hydrophone Array	Joe
Velocimeter	Grip
XBT	Bat
Piston Corer	Big 1
Boomerang Corer	Big 2

EXAMPLE:

Intended Message — "Change projector frequency to 76 Hz, source level to 75 dB, and depth to 300 feet."

Coded Message — "Change Peter Fred 1 to Fred 1 minus 20, Lima to Lima minus 15, and delta to 0.3 delta."

Position Reports

(C) All positions will be reported as range and bearing from center of operating area (53°00'N, 46°00'W).

EXAMPLE:

Aircraft requests position of PIERCE. PIERCE is at 53°10'N, 46°10'W.

Coded Message — "Whiskey Yankee 5240 [illegible] miles bearing 45° true from center of operating area."

(U) In case of emergency where personnel injuries are concerned, p[illegible] language messages will be used.

Annex A

NADC AUTOBUOY SHIP OPERATION PLAN

OBJECTIVES

(U) Support deep passive SONOBUOY development by conducting sea tests to gather information in

a. Ambient noise level as a function of receiver depth,

b. Received signal-to-noise ratio as a function of receiver depth and signal source range.

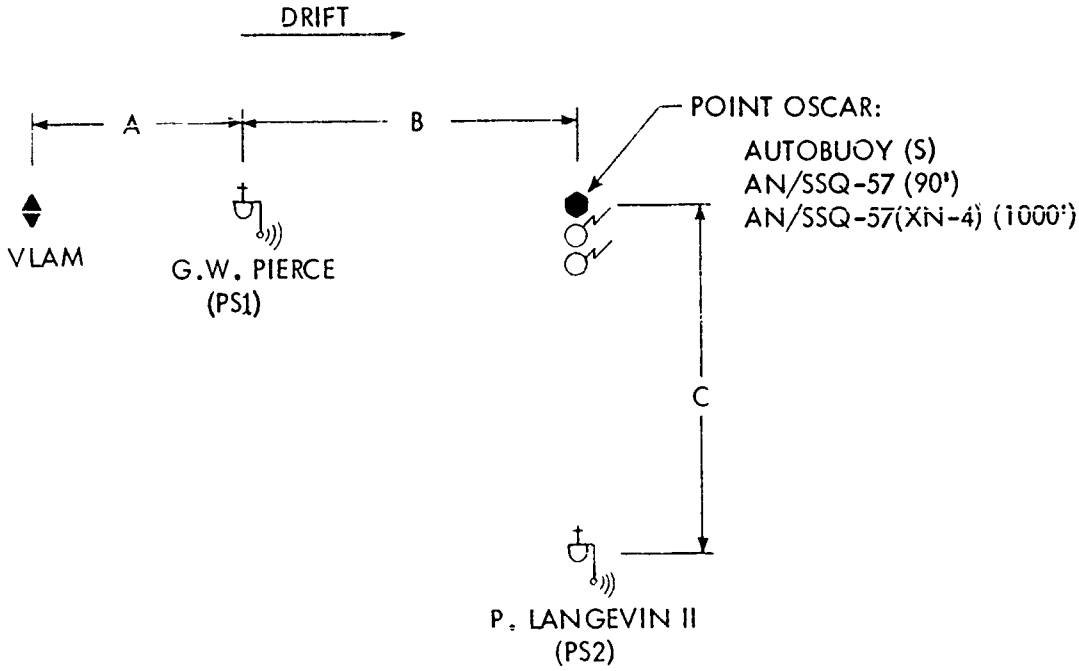
OPERATING PLAN, R/V G. W. PIERCE

(U) When FINEX of the test preceding the next scheduled AUTOBUOY test is declared, PIERCE shall position itself at PS 1 (projector site 1), as indicated in figure A-1. PIERCE shall check the synchronism of its time code generator with the unit aboard LANGEVIN. The projector shall be deployed and checked out for CW operation in anticipation of COMEX, as called by LANGEVIN.

(U) The projector system shall be operated in CW from COMEX to FINEX. If the ability to momentarily interrupt CW operation at regular intervals under precise control by the time code generator is available, a 6-min interval between interruptions shall be established and the exact time of interruption shall be logged. An accurate log of projector operation, referenced to the time code clock, shall be maintained from COMEX to FINEX. A schedule of projector frequencies and acoustic output power shall be provided.

(U) If possible, PIERCE shall maintain a log of the radar range and bearing to the VLAM buoy and to LANGEVIN on a 1/2-hour update schedule, from the time LANGEVIN deploys the first AUTOBUOY until it retrieves the last AUTOBUOY.

(U) Permission must be obtained from the test director aboard LANGEVIN before moving PIERCE during the period between COMEX and FINEX. Projector and time code generator equipment problems should be logged and reported to LANGEVIN.



TEST	RANGE - NAUT. MILES		
	A (APPROX.)	B	C
ALFA	10	20	5
BRAVO	10	25	10
CHARLIE	10	30	15
DELTA	10	35	20

Figure A-1. (U) NADC AUTOBUOY Ship Operation Plan (U)

OPERATING PLAN, R/V PAUL LANGEVIN II

(U) To avoid delays, AUTOBUOY checkout and launch preparations shall be started well in advance of the next anticipated launch time.

(U) When FINEX of the test preceding the next scheduled AUTOBUOY test is declared, LANGEVIN shall transit as quickly as possible to point OSCAR, as indicated in figure A-1. LANGEVIN shall ascertain that the time code generator aboard PIERCE agrees with its own generator.

(U) Upon arriving at point OSCAR, LANGEVIN shall deploy one AUTOBUOY and inform PIERCE of the action. If practicable, a second AUTOBUOY shall be deployed after a predetermined length of time. During the period at point OSCAR, a BT probe shall be launched; a 6000-ft probe will be used, unless it has been determined from previous BT measurements that the deep temperature profile is sufficiently invariant, in which case a 2500-ft probe will be used. Significant points along the bathythermogram shall be relayed to PIERCE.

(U) Two AN/SSQ-57's (90-ft hydrophone) and two AN/SSQ-57(XN-4)'s (1000-ft hydrophone) SONOBUOYS shall also be deployed over the side at point OSCAR, unless it is determined that the AUTOBUOY test shall be conducted without the presence of the project aircraft.

(U) As soon as the last AUTOBUOY has been deployed, LANGEVIN shall proceed as quickly as possible to projector site PS 2, as indicated in figure A-1.

(U) The AUTOBUOY test director shall call COMEX — which may occur prior to LANGEVIN arriving at PS 2.

(U) If PIERCE is within radar range, LANGEVIN shall keep a range and bearing log (updated every 1/2-hour) on PIERCE's position, from the time that the first AUTOBUOY is launched until the last AUTOBUOY is recovered.

(U) The AUTOBUOY tests shall be supported by the NC121 or P-3A project aircraft according to test plan B of Annex C. LANGEVIN shall inform the aircraft of the SONOBUOY channel numbers to be monitored at point OSCAR.

(U) Upon arriving at PS 2, LANGEVIN shall deploy the acoustic projector to a depth of 300 ft and shall check its performance. CW operation should be as soon after COMEX as possible and shall continue to FINEX. If the ability to momentarily interrupt CW operation at regular intervals under precise control

of the time code generator is available, a 6-min interval between interruptions shall be established, and the exact time of interruption shall be logged. An accurate log of projector operation, referenced to the time code clock, shall be maintained from COMEX to FINEX. A schedule of projector frequencies and acoustic output power shall be provided.

(U) LANGEVIN shall keep a continuous radio direction finder watch on the AUTOBUOY beacon frequency.

(U) The AUTOBUOY test director shall announce FINEX, informing PIERCE and the aircraft. At this time, the projector shall be hauled aboard, and LANGEVIN shall proceed as quickly as possible to point OSCAR.

(U) If available when AUTOBUOY resurfacing is expected, the aircraft may be called upon to assist in a visual search. If a buoy appears to be lost, the aircraft shall be called up to institute test plan D of Annex C to assist in recovery.

(U) As soon as the AUTOBUOYS are aboard, LANGEVIN shall proceed to the COMEX point for the next test.

(U) The transit time requirements of LANGEVIN are the controlling factor in determining the time span required to conduct each AUTOBUOY test. Table A-1 of this annex lists the cumulative hours expected to be consumed by the four deployment configurations, starting with FINEX of the VLAM test preceding the AUTOBUOY test and ending when the ships are in position for the VLAM test succeeding the AUTOBUOY test. Times are based on an SOA of 8 knots for LANGEVIN.

Table A-1. (U) Cumulative Test Time Requirements (Hours) (U)

ACTION	TEST			
	ALPHA	BRAVO	CHARLIE	DELTA
FINEX VLAM test	0	0	0	0
PL2* arr. OSCAR	4	3-1/4	2-3/4	2
PL2 dep. OSCAR	4-3/4	4	3-1/2	2-3/4
PL2 arr. PS2	5-1/2	5-1/4	5-1/2	5-1/4
PL2 dep. PS2	12-1/2	12-1/4	12-1/2	12-1/4
PL2 arr. OSCAR	13-1/4	13-1/2	14-1/2	14-3/4
AUTOBUOYS aboard	15-1/4	15-1/2	16-1/2	16-3/4
PL2 arr. site next VLAM	16-1/2	17-1/2	19	20
*R/V PAUL LANGEVIN II				

Annex B

VLAM SHIP OPERATION PLAN

OBJECTIVE

(U) Measure, through the VLAM system, data that will yield both the vertical directionality of the ocean noise field as a function of frequency and the vertical directional properties of a target signal as a function of target range and depth.

OPERATION INSTRUCTIONS

(U) Upon arrival on station, PIERCE shall perform prelaunch system checks on the VLAM system until first light of day on 31 July, at which time deployment shall commence. After the VLAM system is in the water and a "go" condition is indicated, PIERCE shall position itself at the designated range from the VLAM buoy and maintain that range while the Edo Western projector is lowered into the water to preselected depth No. 1 and then powered. A short while later, the projector depth shall be increased and the projector powered again; this sequence of operations shall continue until the projector is at 500 ft, at which time the projector shall be retrieved. After projector retrieval, PIERCE and LANGEVIN shall position themselves downwind of the VLAM buoy at ranges of 2 and 20 nmi, respectively. A BT recording to 6000 ft depth shall then be requested of LANGEVIN, while a 2500-ft BT recording shall be made aboard PIERCE. After this operation, the VLAM test period No. 1 will commence.

(U) A typical VLAM test period is a well-structured, 27-hour exercise that consists of nine subdivisions, or sequences. Each sequence, except the last, is of 3-hours duration and is divided into data recording (1-3/4 hours) and ship maneuvering (1-1/4 hours). There are six possible data recording modes: a 5-min CAL E Hi gain, a 5-min CAL E Lo gain, a 5-min CAL A Lo gain, a 5-min pulsed signal, a 40-min CW recording, and a 40-min noise recording. The recording sequence ends with a second CAL E Hi gain. The ship maneuvering part of the sequence permits the ships to open range to specific distances and redeploy the projectors for the next sequence. Since the final sequence of each test period does not involve subsequent ship maneuvering, the final sequence has a duration of only 1-3/4 hours. The structure of the test period is shown in figure B-1. The range intervals corresponding to each sequence for the two ships and the operating times within a test period and other data are shown in table B-1. Figure B-2 is a sketch of the ship positions during VLAM operations.

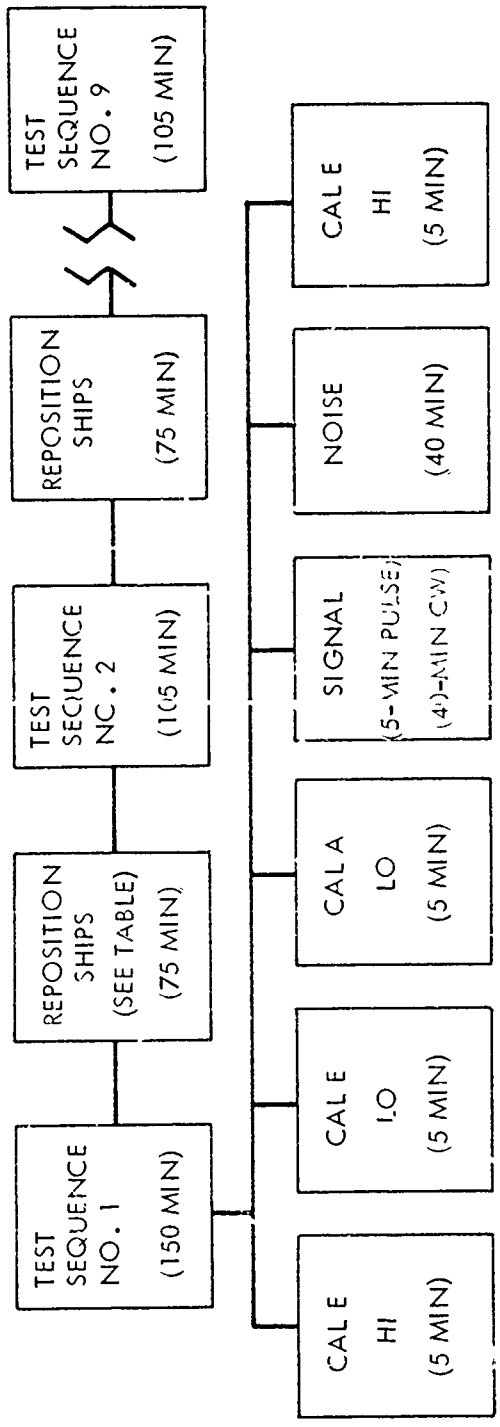


Figure B-1. (U) VLAM 21-hr Test Period Plan (U)

Table B-1. (C) VLAM Ship Operation Data (U)

Time from beginning of test at beginning of sequence (hr:min)	Test Sequence Number	Position of Ship No. 1 (range to VLAM buoy) (nmi)	Error Band for Ship No. 1 (nmi)	Position of Ship No. 2 (range to VLAM buoy) (nmi)	Error Band for Ship No. 2 (nmi)	Position of SANDS (range to VLAM buoy) (nmi)
00:00	1	4	±1/2	20	±1	300 nmi for VLAM Test Period No. 2
03:00	2	5	±1	25	±2	200 nmi for VLAM Test Period No. 3
06:00	3	6	±1	30	±3	
09:00	4	8	±1	34	±3	Not participating in VLAM Test Periods 1 and 4
12:00	5	10	±1	38	±4	
15:00	6	12	±2	43	±4	
18:00	7	14	±2	50	±5	
21:00	8	16	±2	55	±5	
24:00	9	17	±2	60	±5	
27:00 (End)						

30:45 is time at which ships No. 1, 2, and 3 are in position for AUTOBUOY COMEX. At end of sequences (1 hour 45 min), the ships will move to the next position. If both ships are within the error band, ships will not move but continue with next sequence.

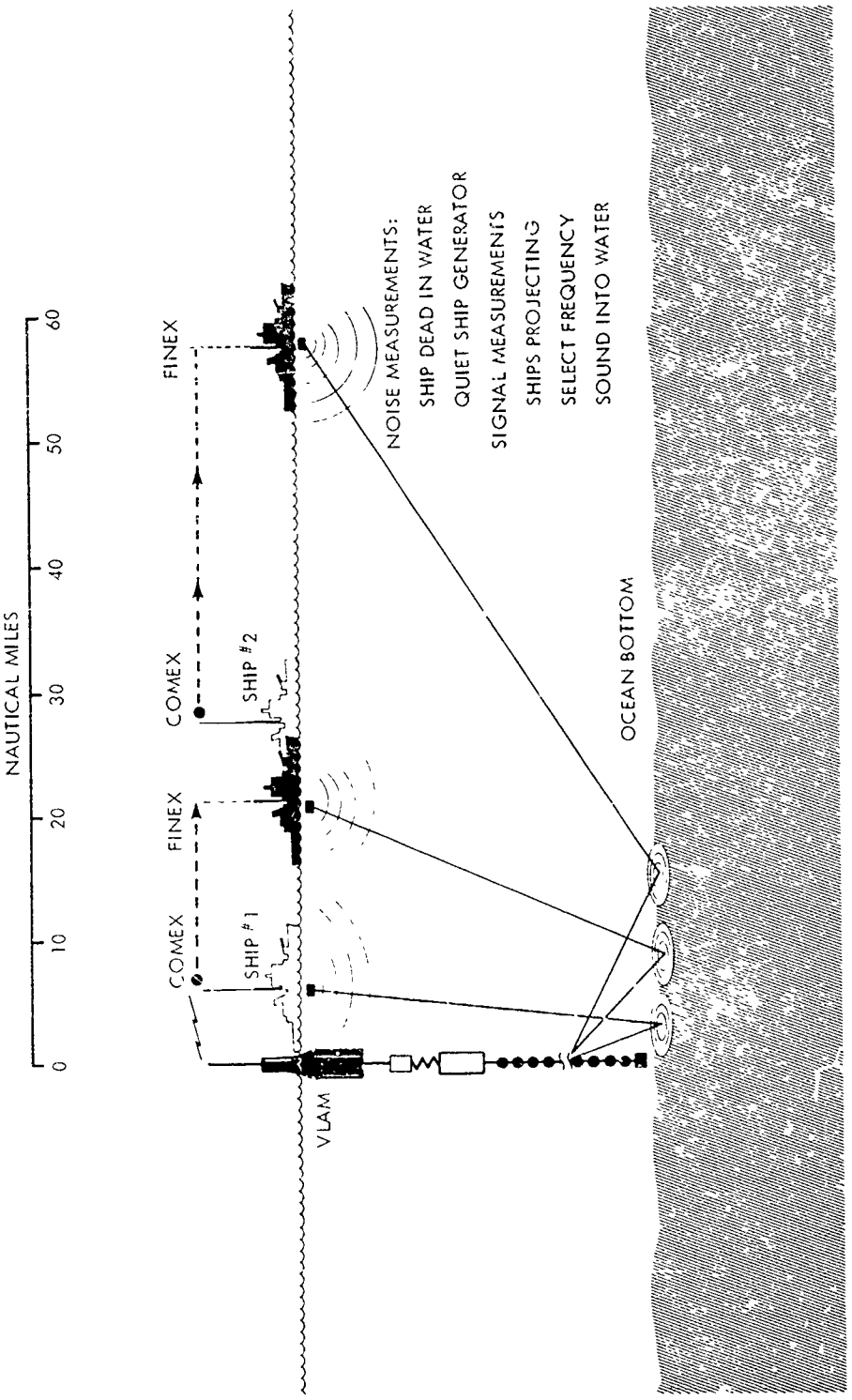


Figure B-2. (U) Ship Positions During VLAM Operations (U)

(U) PIERCE shall contact LANGEVIN and announce COMEX, FINEX, projector depth for the succeeding test period, and the beginning and end of each signal mode of a sequence. At the FINEX of each test period, (27 hours from COMEX), LANGEVIN shall be requested to obtain a 2500-ft BT recording. The ships shall then commence to position themselves according to table B-1 for the succeeding AUTOBUOY test, as described in Annex A.

(U) During the VLAM test periods, the aircraft will initiate plan A of Annex C in accordance with the schedule shown in figure 3 of the main text.

DATA LOGS

(U) A data log aboard each ship shall contain the following information:

a. Radar range and bearing of VLAM buoy to ship. One entry every 30 min.

b. Radar range and bearing of companion ship to logging ship. One entry every 30 min.

c. Radar range and bearing of nearest transiting ships. One entry every 30 min. for each ship when possible. If the ship in transit is close to the logging ship and moving fast, enter range and bearing every 15 min.

d. Ship position (OMEGA). One entry every 30 min.

e. Ship status (under way and engine rpm, lay to, and quiet ship).

f. Ship-to-ship-to-aircraft communication, subject and time of contact. One entry for each contact.

g. Ship drift rate and direction. One entry every 30 min.

h. Wind speed and direction, sea state, wave height. One entry every 30 min.

i. Barometric pressure and air temperature. One entry every 30 min.

(U) All participating ships shall deploy, retrieve, and record powered times and output levels of the projectors, making one entry at beginning and end of each signal mode.

(U) PIERCE only shall record the following:

a. VLAM electronic system checkout: date, time, problems, solutions, and personnel involved.

b. In-water system checkout: date, time, problems, solutions, and personnel involved.

c. Deployment: date, time of each subsystem deployment, problems, solutions, personnel opinions or suggested alterations for future reference, and time of diver operations and deployment completion.

d. Retrieval: date and time of each subsystem retrieval, problems, solutions, personnel opinions or suggested modifications for future retrievals, and time of retrieval complete.

e. Servicing: date, time, and problems, with solutions, regarding repair of equipment, battery charging procedures, cable length changes, and other servicing requirements.

Annex C

AIRCRAFT OPERATION PLAN

OBJECTIVE

(U) Support deep passive SONOBUOY development, VLAM, and AUTOBUOY test programs by making simultaneous measurements of ambient noise and ship traffic.

OPERATING PLAN

(C) Upon arrival at location 53°00'N 46°00'W, the aircraft crew shall make a visual and radar search for PIERCE. The radio operator shall contact PIERCE on primary UHF and HF; the operator shall guard primary HF and UHF for the duration of the test, except for necessary position reports, etc. After initial radio contact, communications shall be maintained by project personnel on primary UHF. In general, radio communications will be held to a minimum. The test director aboard PIERCE shall request a test A, B, or D. If no radio contact is made after 1 hour on station, the aircraft shall proceed with a test A. The three test plans are described below.

Test Plan A

(C) Test A is allocated to assist the VLAM tests. The aircraft shall fly above PIERCE and launch an AN/SSQ-36 BT buoy within 1 to 2 nmi of PIERCE. Aircraft shall record the bathythermogram on both the paper chart and magnetic tape. The aircraft shall make four buoy plants as follows:

Plant No.	Location
1	50 nmi north
2	50 nmi south
3	50 nmi east
4	50 nmi west

The buoy plants shall be launched using the VLAM buoy as the center of the 50-nmi radius circle (figure C-1). The center of the plants shall be referred to hereafter as point OSCAR. The VLAM buoy, with antenna, extends more than 30-ft above sea level and is equipped with a radar transponder. If difficulty in maintaining contact with the VLAM buoy develops, PIERCE shall be used as point OSCAR. Each buoy plant will consist of two AN/SSQ-57 SONOBUOYS

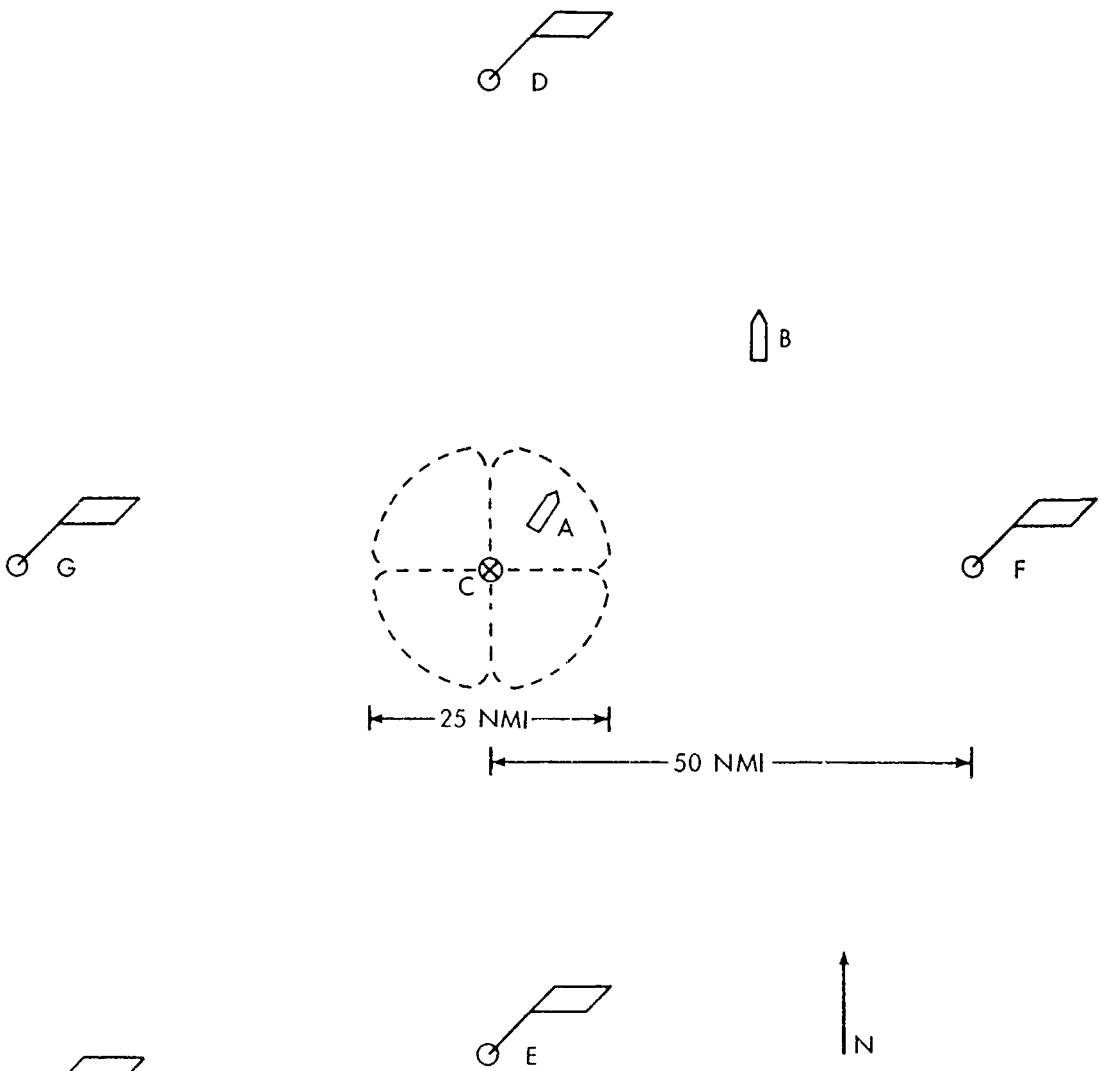


Figure C-1. (U) Test A Configuration (U)

preset for eight-hours life and one AN/SSQ-36 BT buoy. The navigator shall log the location of each plant and the time of launch. The radio operator shall log the plant location, relative to point OSCAR, and the time of launch. After all four buoy plants have been made, the aircraft shall return to point OSCAR and fly a 25-nmi-diameter clover leaf pattern, centered on point OSCAR, at cruising speed and an altitude of 9000 ft. When the aircraft is over point OSCAR (roughly every 10 min), the radio operator shall log all ships within a 100-nmi radius and the "on-top" time. The pilot/copilot shall record estimated wind speed and sea state once every hour. Project personnel shall record the SONOBUOYS on the Ampex AR 1700 and log ambient noise meter readings for two complete magnetic tapes (approximately 2 hours).

(U) The radar operator and project personnel shall choose four ships to be "rigged." The choice will be based on the range, size, and speed of the ships in the area. Ships within 20 nmi of point OSCAR will be chosen first. If more than four ships are within 20 nmi of point OSCAR, the largest and the fastest ships will be chosen. If less than four ships are within 20 nmi, the next range considered will be the first convergence zone (about 35 nmi). If less than four ships are within 100-nmi radius, repeat the "rigging" on the ships available. Each rigged ship will be photographed. The pilot shall announce on-top the ship and the ship's estimated heading. The navigator shall record the on-top ship location, on-top ship time, and the ship heading announced by the pilot. The radar operator shall record on-top ship time and the range and bearing to point OSCAR. The aircraft shall launch two AN/SSQ-57 SONOBUOYS within 1 to 2 nmi of the ship. Project personnel shall tape record the ship signature for at least 15 min. A separate magnetic tape with rigging data shall be made.

(U) After rigging four ships, the aircraft shall return to monitoring the four SONOBUOY plants from the clover leaf pattern. After one complete magnetic tape (approximately 1 hour) has been recorded, the navigator shall log the location of point OSCAR and the time. An AN/SSQ-36 BT will be launched on-top of each of the four buoy plants. To get a better on-top indication, the aircraft shall proceed to 4000 ft altitude. The pilot shall announce on-top, and the radar operator shall log the range and bearing from point of announcement to point OSCAR. Project personnel shall record the bathythermogram information on both the paper recorder and magnetic tape. The navigator shall log the location and time of the pilot announcing on-top. As it leaves station to return to Goosebay, the aircraft shall notify the test director aboard PIERCE.

Test Plan B

(U) Test B is allocated to assist the AUTOBUOY tests. It is similar to test A, but the aircraft will launch the four SONOBUOY plants, using LANGEVIN as point OSCAR. The only other difference between the tests is that during test B, the aircraft will also tape record four AN/SSQ-57 SONOBUOYS deployed by LANGEVIN. The aircraft project personnel aboard the aircraft will be notified about the RF channels by personnel aboard LANGEVIN. Locations are shown in figure C-2.

Test Plan D

(U) Test D is provided to assist personnel aboard PIERCE and LANGEVIN if the VLAM buoy or an AUTOBUOY is lost. When test D is requested by the test director, the aircraft shall proceed to a low altitude (approximately 1000 ft). All available personnel shall be assigned to conduct a visual search. The aircraft will fly a spiral out from the test ship, as assigned by the test director. If the buoy is sighted, the aircraft will assist the test ships by supplying range and bearing information and launching a smoke light (Mk-6) on-top the lost buoy.

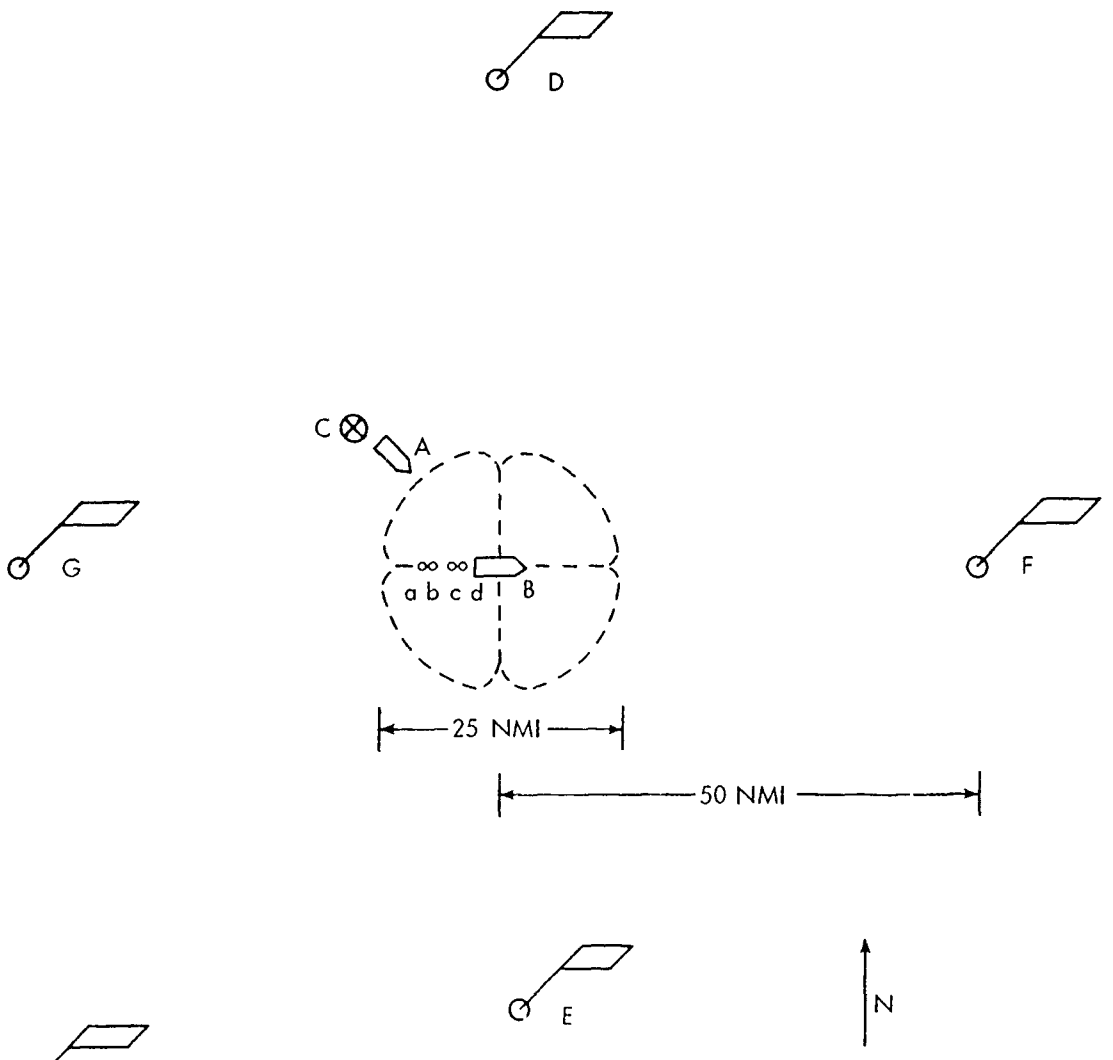
CONTINGENCIES

(U) If after 1 hour on station, the aircraft cannot locate or establish radio contact with PIERCE or LANGEVIN, the aircraft shall proceed with test A using a Mk-6 smoke light as point OSCAR. After arrival at Goosebay, project personnel shall attempt to contact the ships via shore stations.

(U) If the aircraft cannot fly because of equipment failures or weather, project personnel shall pass this information to the test director aboard PIERCE via the shore station.

(U) Contingency days have been scheduled for possible aircraft or shipboard equipment problems. If the tests are complete or behind schedule, the test director may either request that the aircraft terminate tests on the final test date or request more project flights after the final test date.

(U) Ship traffic logging is an important aspect of this project. To ensure good data, the following procedure shall be followed. On nonflying days, the navigator and the radar operator will construct, from their logs, plots of ship locations and tracks and buoy plant locations, and discuss the results with aircraft project personnel. Should improvements in the measuring technique be suggested, the changes in test procedure shall be made before the next flight.



SONOBUOY PLANT (2 AN/SSQ-57'S, 1 AN/SSQ-36)

A R/V G.W. PIERCE

B R/V PAUL LANGEVIN II

C VLAM BUOY

- - - - AIRCRAFT MONITORING TRACK

a,b,c,d, - AN/SS Q-57's DEPLOYED BY R/V PAUL LANGEVIN II

Figure C-2. (U) Test B Configuration (U)

Annex D

ENVIRONMENTAL DATA PLAN

(U) Environmental data collected by surface vessels and aircraft will be turned over to the Oceanographic Data Coordinator or sent to U.S. Naval Oceanographic Office (Code 7005) Washington, D.C. 20390, as soon as possible upon completion of the exercise. These will include such items as XBT traces, logs, and paper tapes; AXBT traces and tapes; aircraft navigation logs; SVP/STD logs and/or traces; echo-sounder logs, ship navigation logs; meteorological logs; etc. Blank log sheets will be provided to all ships prior to sailing.

(U) All ships will collect pertinent meteorological data every hour; blank log sheets will be provided. All ships will sample sea surface temperature every two hours while underway and tabulate the readings in Sea Surface Temperature Log 3167/71A (3-38). Temperatures should be measured by bucket thermometer if possible.

(U) SANDS, LANGEVIN, and PIERCE will take XBT drops every four hours while underway as follows: 6000-ft XBTs at 0000 and 1200 Z, and 2500-ft XBTs at 0400, 0800, 1600, and 2000 Z. When drifting, SANDS, LANGEVIN, and PIERCE will make a 6000-ft XBT drop at 1200 Z and 2500-ft drops at 0000, 0600, and 1800 Z.

(U) Expendable XBTs are to be coded as outlined in Bathythermograph Log 4167/10A (1-68). All XBT traces are to be identified by ship, position, date, time, and consecurive number, regardless of whether the XBT was good or bad. If any XBT trace is determined by the SSOB to be questionable, another probe should be dropped immediately; this second XBT trace should be assigned a new consecutive number. The maximum depth attained by a T-5 (6000-ft) probe will be reduced by ship speeds above six knots.

(U) Sound velocity or STD cast data will be coded using the HISTD code outlined in the Radio Transmission Log for Salinity, Temperature, Depth and Sound Velocity Data, 3167/43 (7-68).

(U) SANDS, LANGEVIN, and PIERCE will collect continuous bathymetric data while underway. The data should consist of a navigation record of time, latitude, and longitude for each fix and an echo-sounder record of depth versus time. A master log of these two records should be maintained as follows:

Log Book

- Soundings every 5 minutes
- Time (Z) and depth of peaks and valleys
- All course and speed changes with exact Z time
- Exact start and stop times (Z) at station and number of station
- XBT, SVP, STD, etc., numbers with exact time (Z)
- All audio checks for scale
- Time (Z) when entering or leaving a port or sea buoy
- Course, speed, and date at top of each page
- All fixes (star, LORAN, satellite, omega, etc.) with exact time (Z).

Log on precision depth record (PDR) tape

- All course and speed changes, with event marker
- Scale, time (Z), date, course, speed, and expedition name every four hours, with event marker
- Each hour mark scale and time (Z), with event marker.

Note 1: Make all marks with felt pen. Print in small letters and as far to the right as possible. Do not write on bottom trace.

Note 2: Leave PDR running once started and phased. Do not adjust it to ship's time; use WWV or CHU signals for rephasing.

(U) A position fix should be made at least every hour and annotated as to type. Echo-sounder log entries should be made at least every 5 minutes, and should be logged as all corrected or all uncorrected depths. Depths can be either fathoms or meters, and times should be GMT for all logs. Electronic or satellite navigation fixes should be accurate to 0.1 min. Abbreviations should be standardized as follows:

c/c	change course	o/c	on course
c/s	change speed	u/w	under way

sta	station	s/o	steady on
a/c	audio check	fms	fathoms
cus	course	kts	knots
spd	speed	dpt	depart

(U) A smooth plot of track-line depths and the original echogram analog records are highly desirable for checking purposes. A plot of deviations from the great circle track will be made to the same scale as the bathymetric smooth plot of track line depths. These will be returned to the originating institution when analysis is completed.

(U) The Oceanographic Data Coordinator will review, as promptly as possible after the exercise, the ship and aircraft environmental data obtained for completeness and adequacy for project objectives. The Coordinator will have the data put on punched cards and plotted for editing purposes.

(U) No additional plotting or coding of environmental data beyond that outlined above is required at sea. However, any plots of environmental data made either during or after the experiment will have the following formats:

a. XBT, AXBT, and other data shallower than 1000 m depth will be plotted to the following scales: sound velocity on the abscissa to a scale of 20 m/sec per in.; depth on the ordinate to a scale (left hand) of 100 m per in. for a total scale length of 10 in. (1000 m); the right-hand ordinate scale will be labeled to show each 200 ft.

b. Composite displays showing each plot of sound velocity versus depth (for a given location) at a position along the abscissa that indicates the time at which it was taken will have a time scale of 10 hr per in. along the abscissa.

c. Preliminary bathymetric-profile diagrams will have a horizontal scale of 20 nmi per in. reading from west to east and a vertical scale of either 500 fathoms per in or 1000 m per in.

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13. ABSTRACT

This document describes the operational aspects of the signal and noise directionality, ambient noise, bottom characteristics, and oceanographic experiments that comprise Phase 2 of NORLANT 72. The command and control organization, event details, schedules of events, and plans for ships, aircraft, communications, and environmental data are delineated for the studies to be conducted July-August 1972 in the Labrador Basin.

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N00014-71-C-0088	Unavailable	CONTINUATION OF LRAPP FINAL REPORT (U)	Bell Laboratories	720201	AD0520426; NS; ND	U
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